Place of tectonic and relief evolution on temporal evolution of the Folly Massif karstic drainage system (Samoëns, Alpes, France): insights from geomorphologic observations and water table level cycles

Xavier Robert - ISTerre, IRD, France
Stéphane Lips - CETHIL, INSA-Lyon, France
Laurent Morel - Ecole Centrale de Lyon, France

Groupe Spéléologique Vulcain

Simposio Carst Peru 2016, Tarapoto

Mountain belt evolution and climate

- > 3 Ma : Sparse glaciations in the N hemisphere and High Latitudes
- Since 3 Ma : More and more extensive glaciations

  ➡ **Global climate change ~ 3 Ma**

  ➡ **Effects on erosion ?**

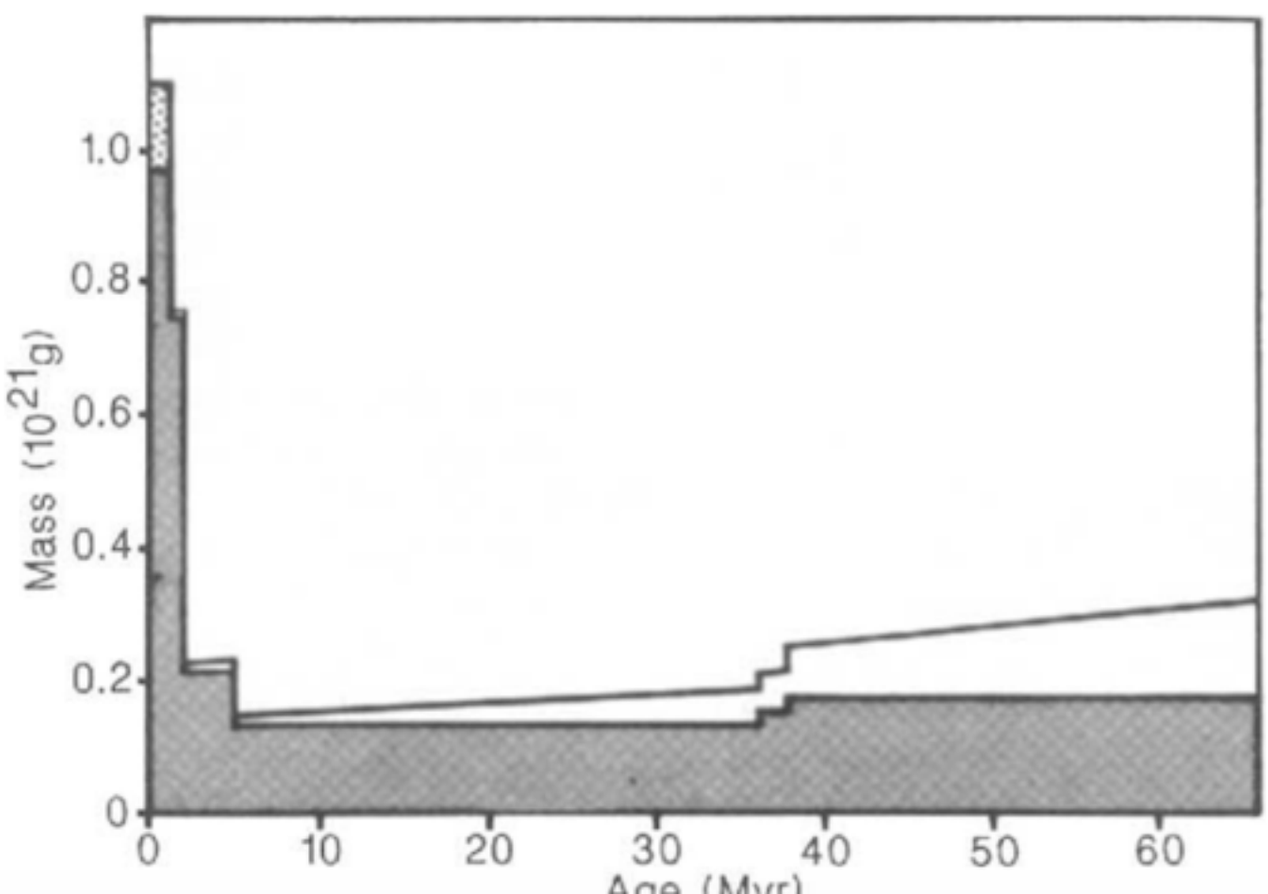
Mountain belt evolution and climate

REVIEW ARTICLE

Late Cenozoic uplift of mountain ranges and global climate change: chicken or egg?

Nature, 1990

Peter Molnar & Philip England



- Late Cenozoic sediments records in Mexico Gulf

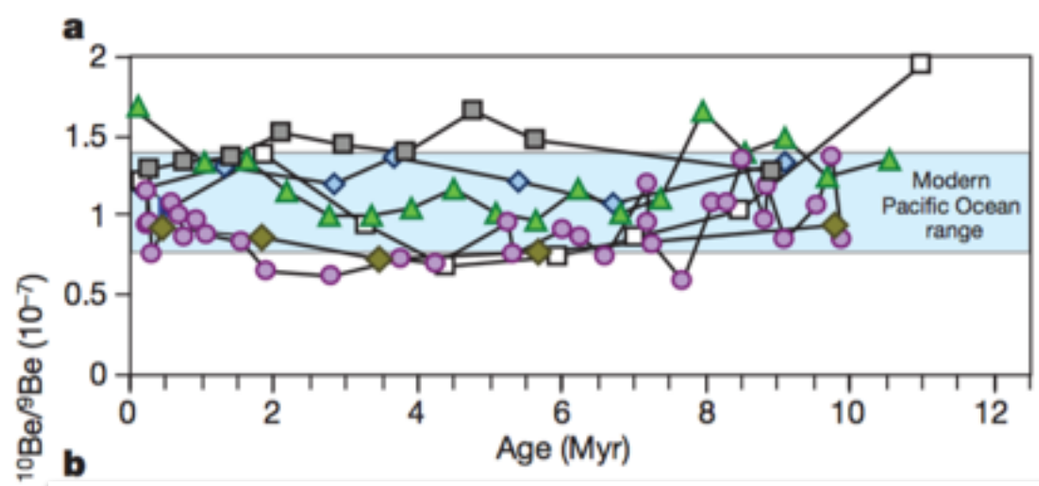
Mountain belt evolution and climate

Vol 465|13 May 2010|doi:10.1038/nature09044 nature

LETTERS

Long-term stability of global erosion rates and weathering during late-Cenozoic cooling

Jane K. Willenbring[1] & Friedhelm von Blanckenburg[1]



Mountain belt evolution and climate

Contents lists available at ScienceDirect

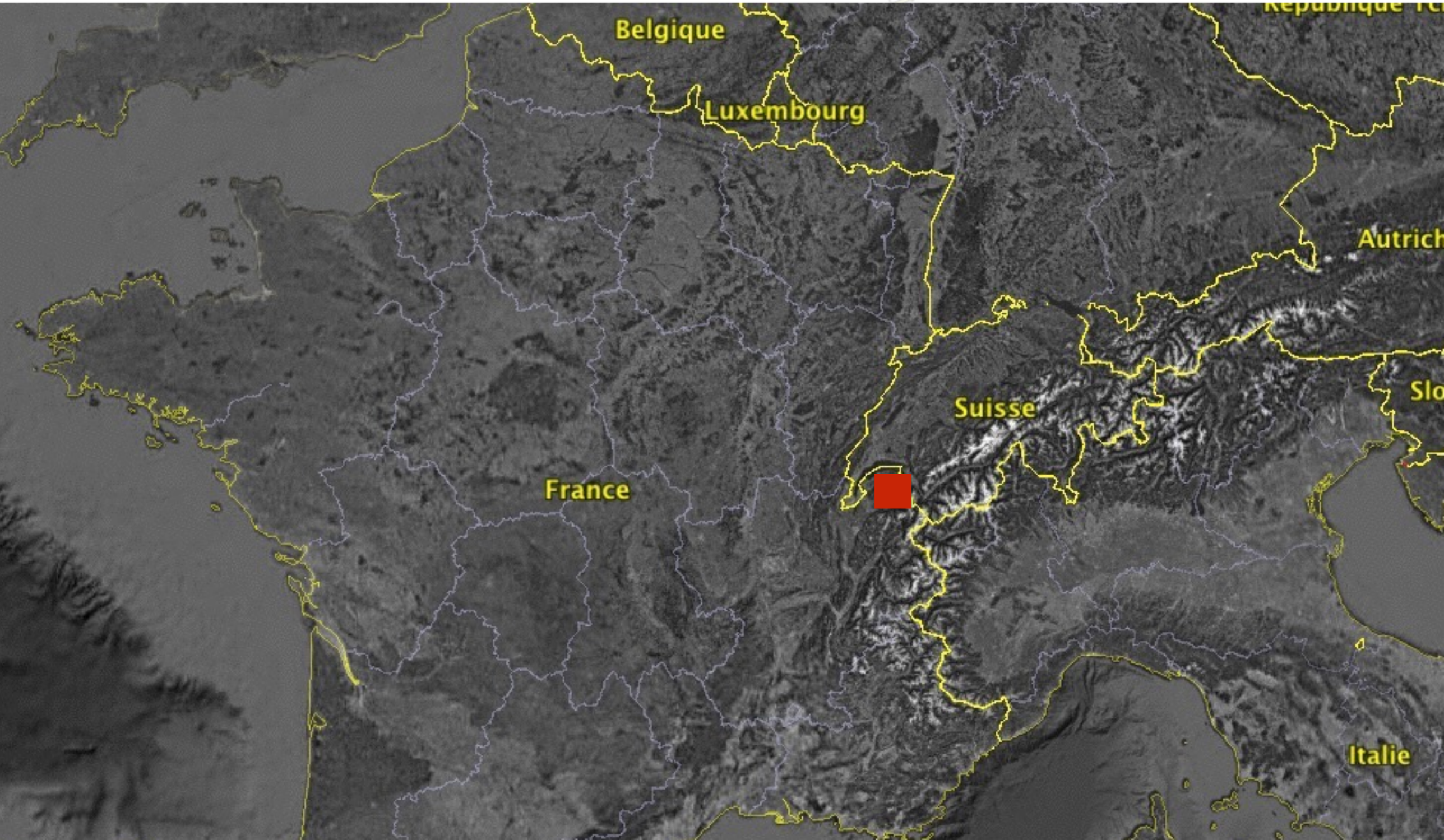
Geomorphology

journal homepage: www.elsevier.com/locate/geomorph

Snežna jama (Slovenia): Interdisciplinary dating of cave sediments and implication for landscape evolution

Philipp Häuselmann [a,*], Andrej Mihevc [b], Petr Pruner [c], Ivan Horáček [d], Stanislav Čermák [c], Helena Hercman [e], Diana Sahy [f], Markus Fiebig [f], Nadja Zupan Hajna [b], Pavel Bosák [c]

Studied area



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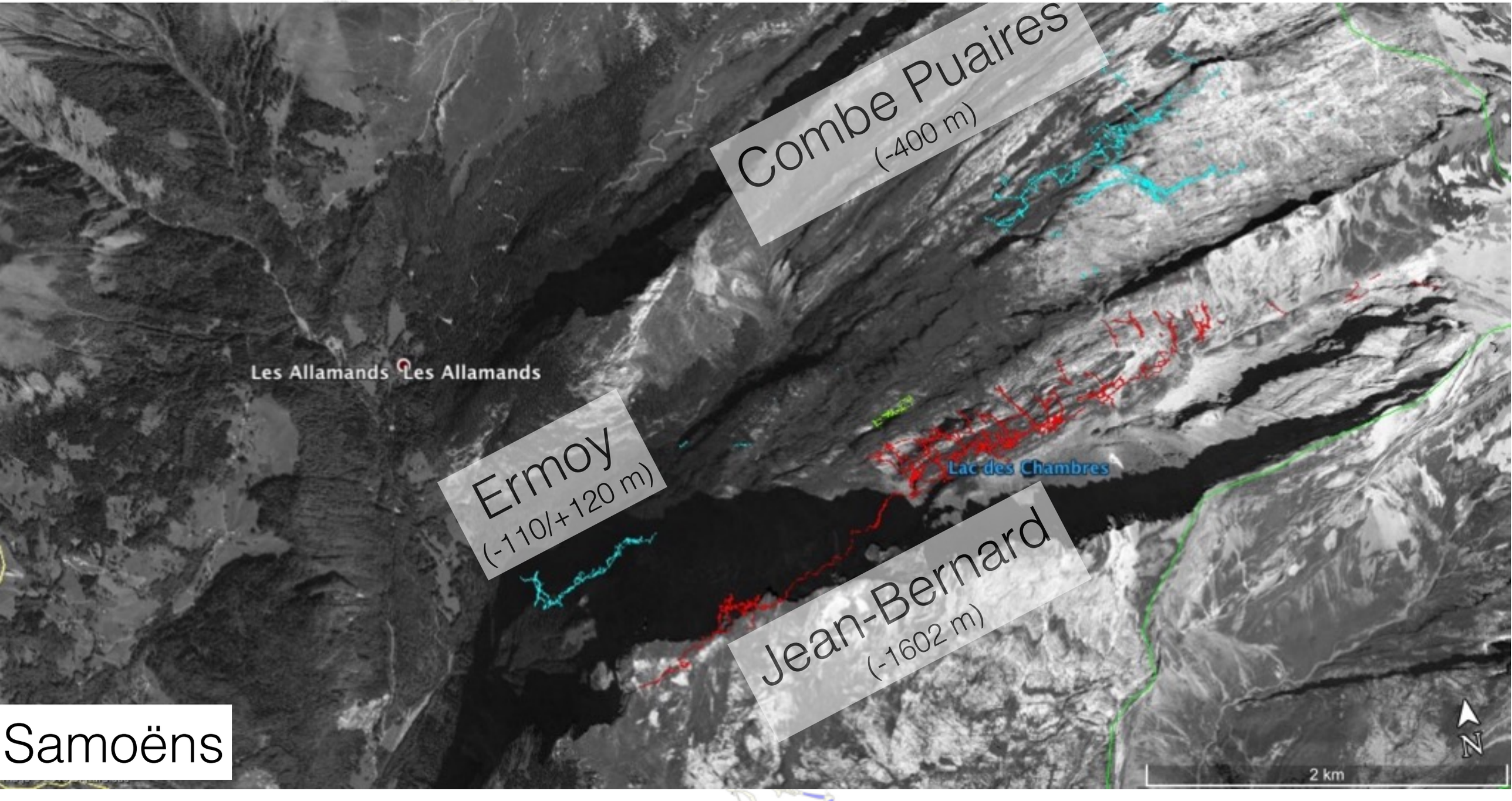

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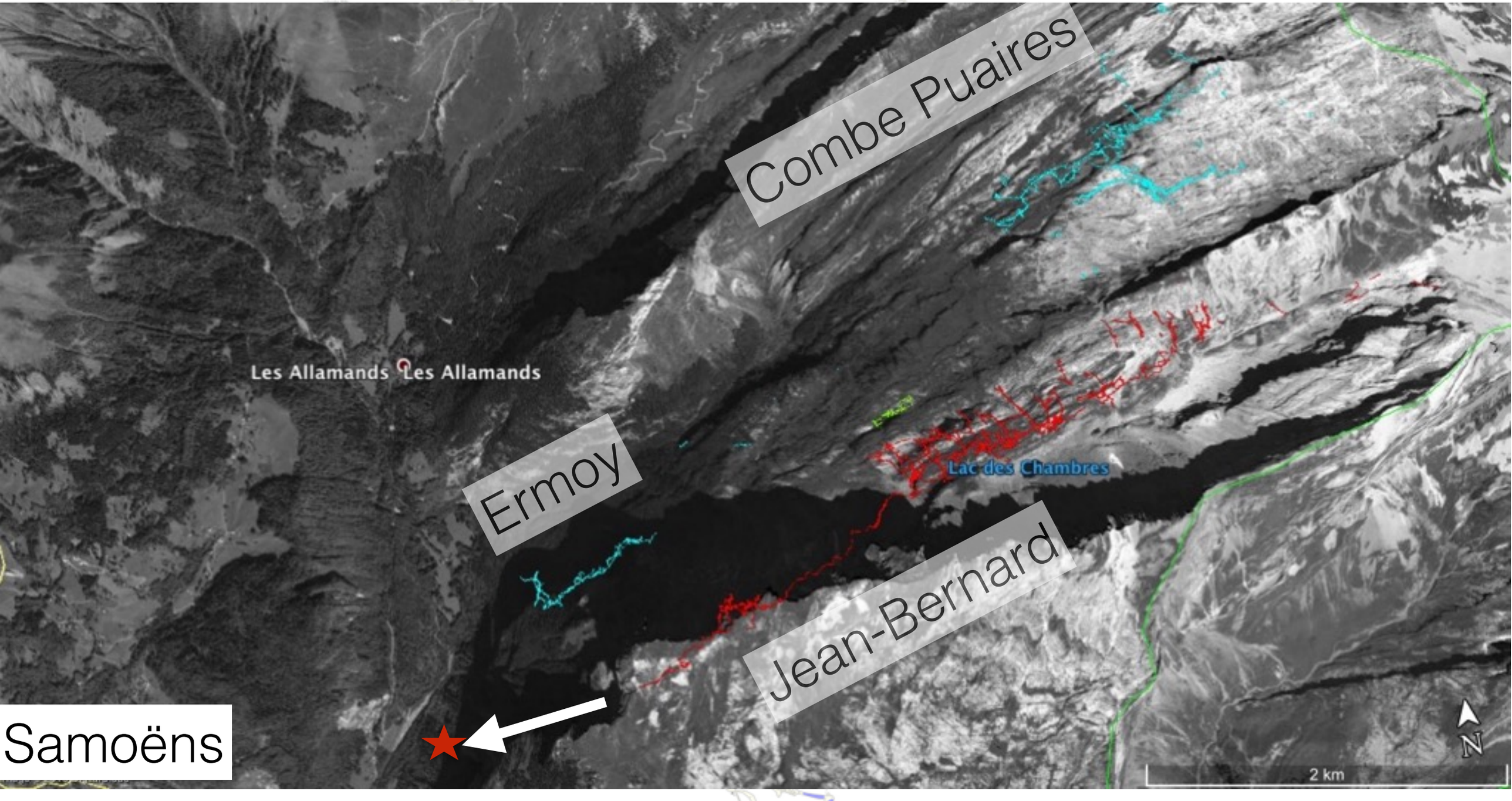

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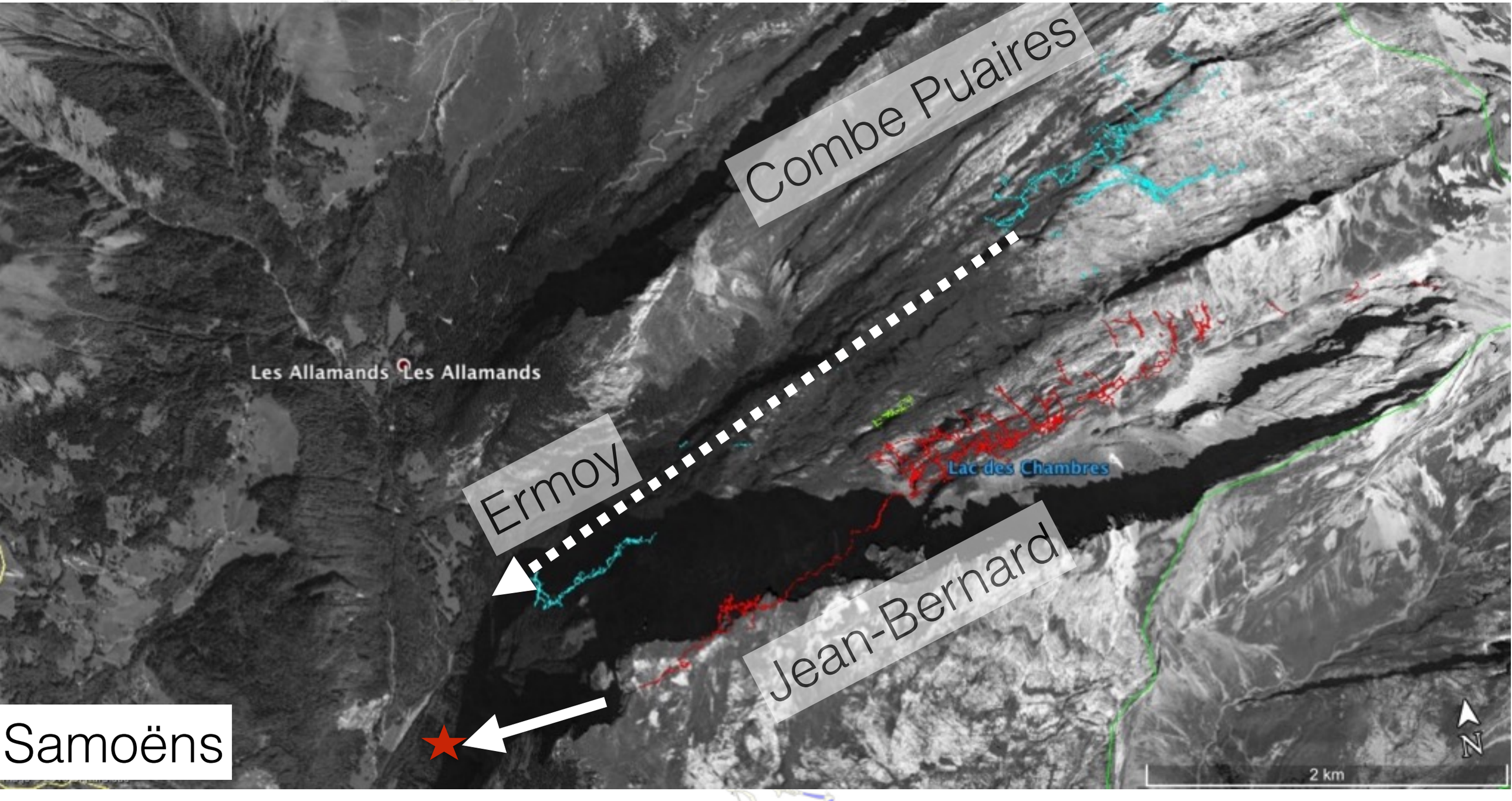

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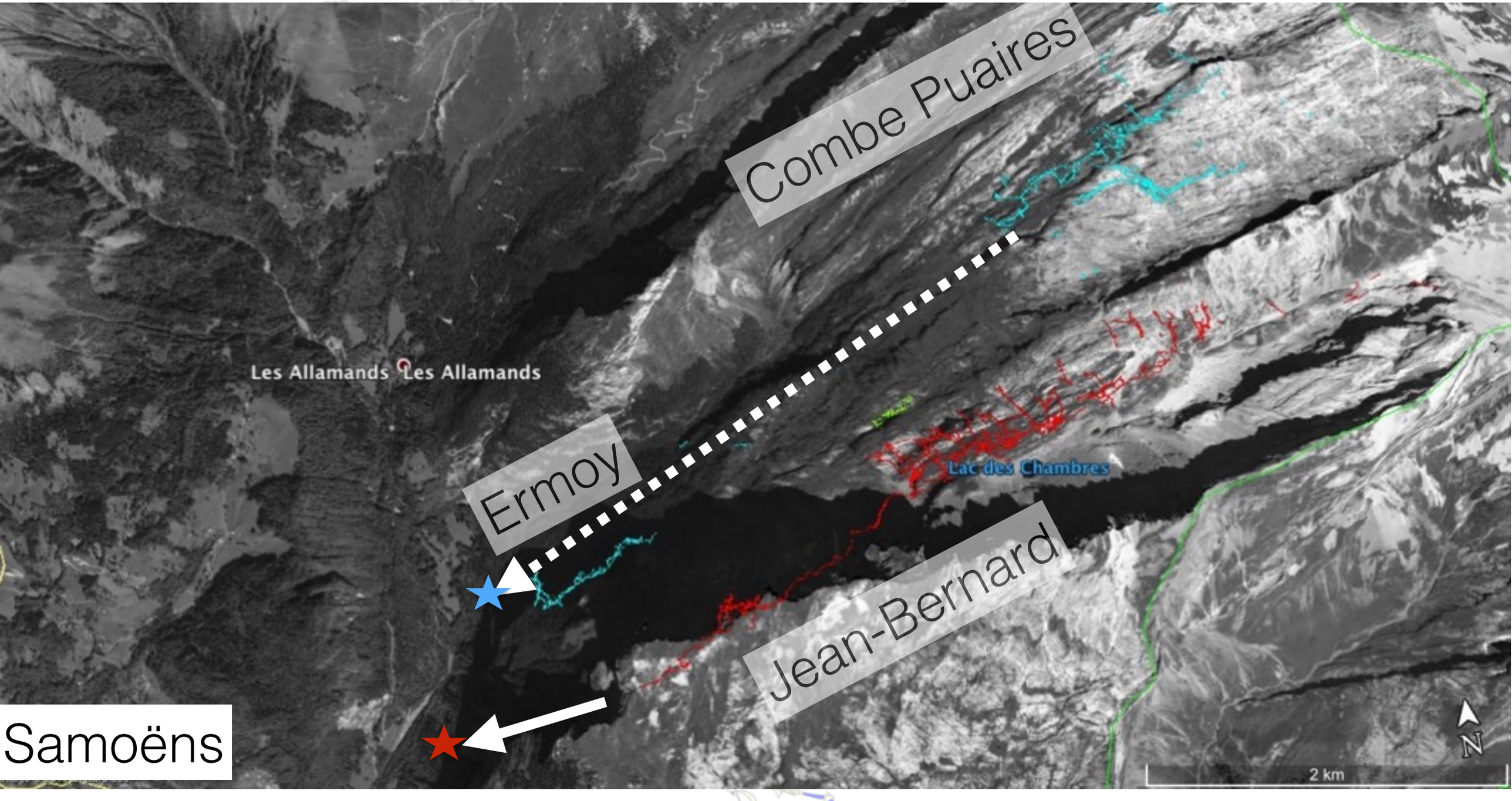

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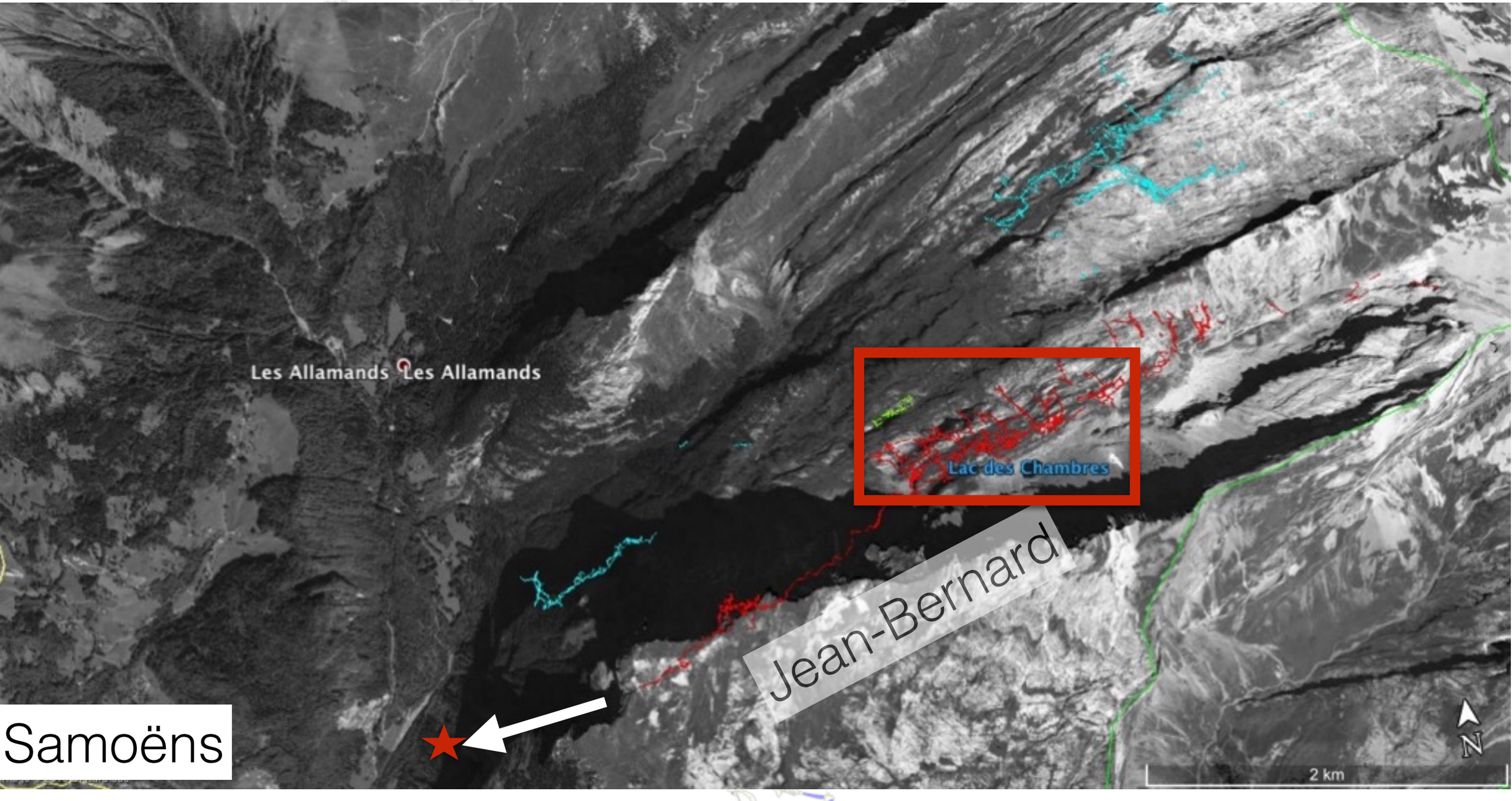
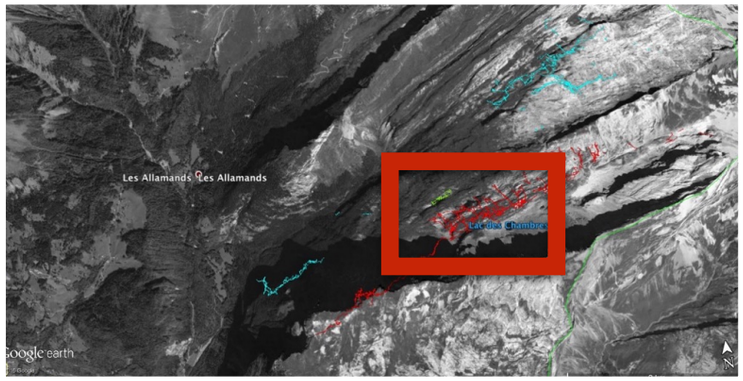
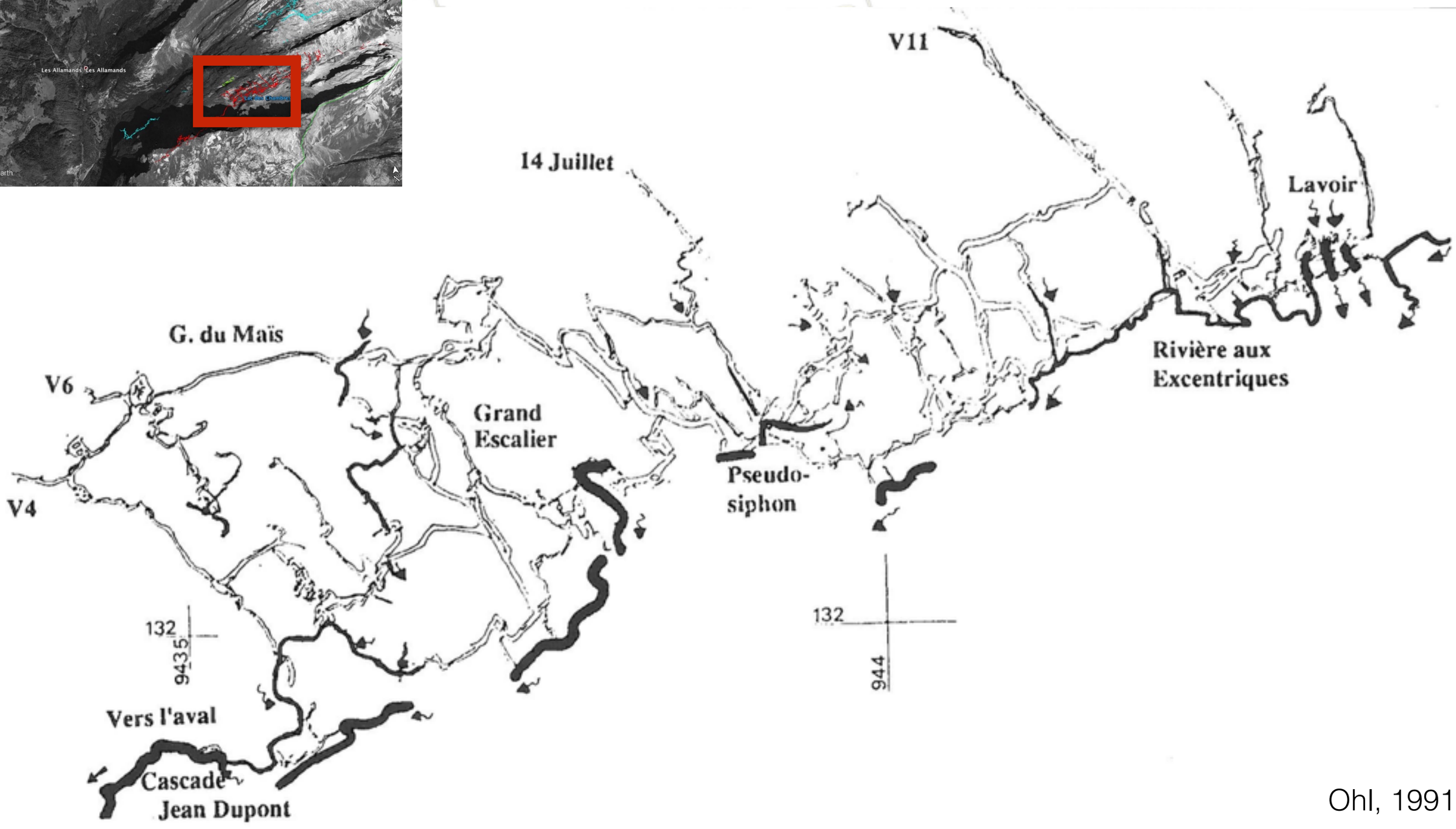


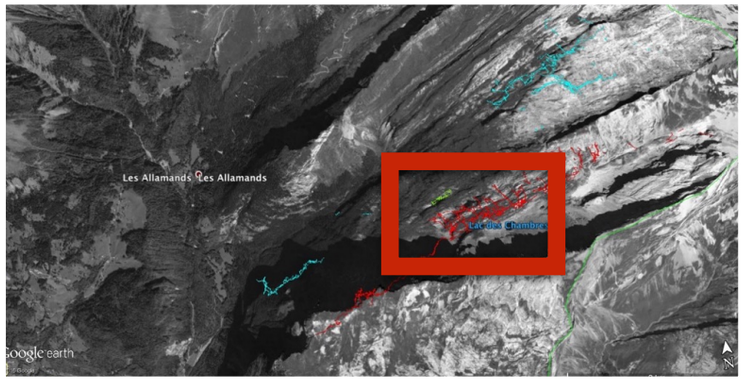
Presents-day drainage

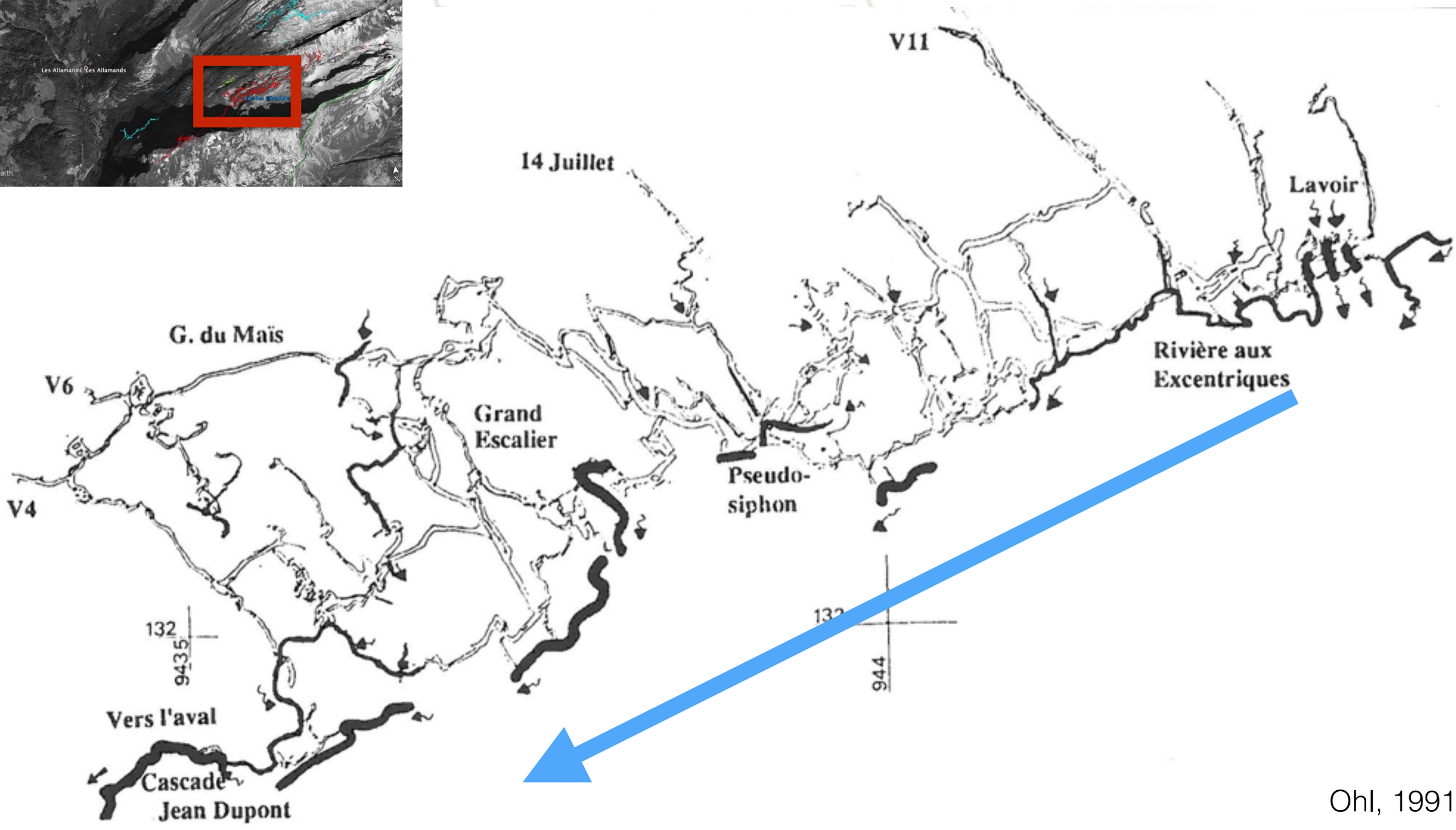




Ohl, 1991

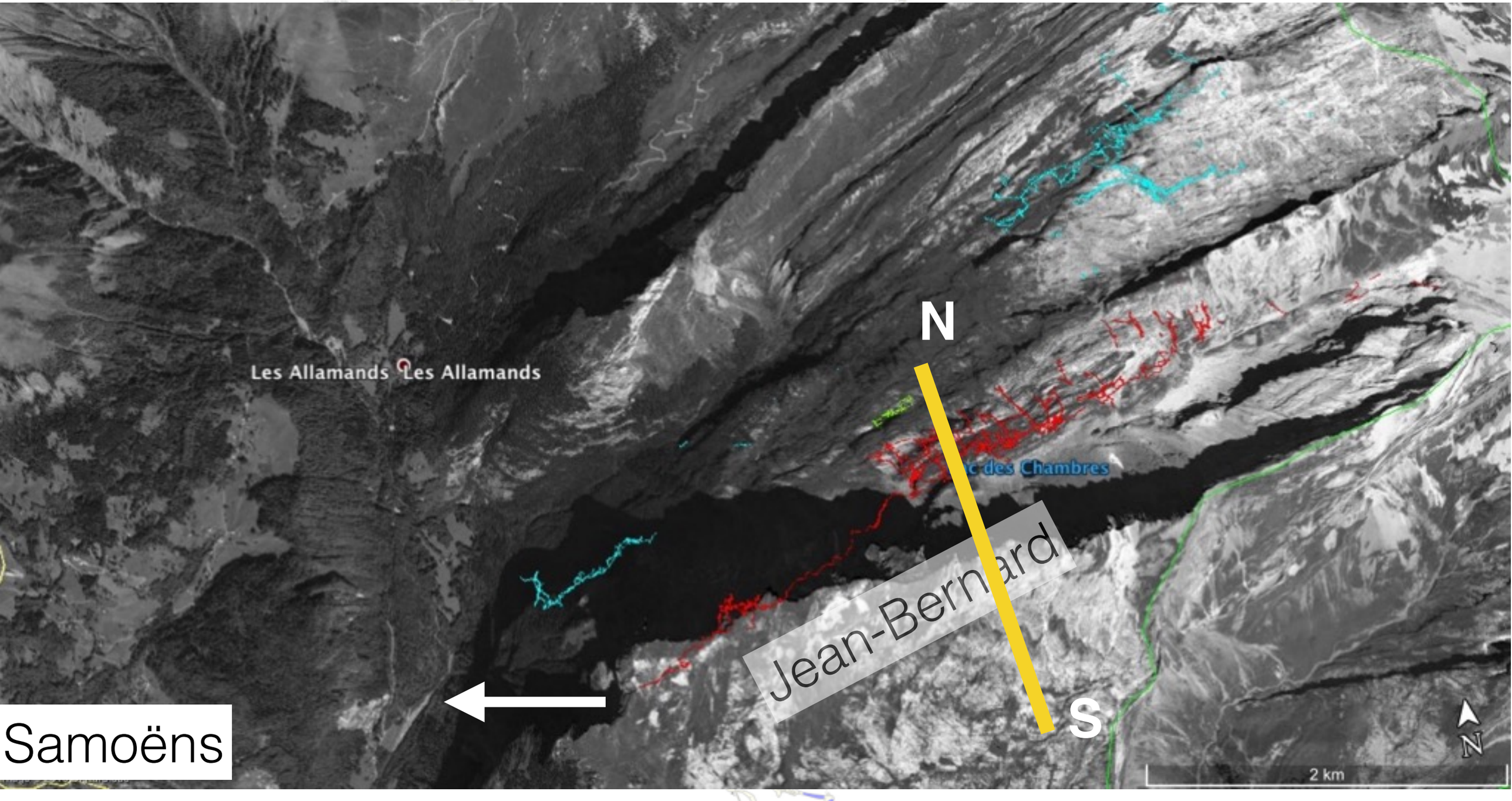
Presents-day drainage



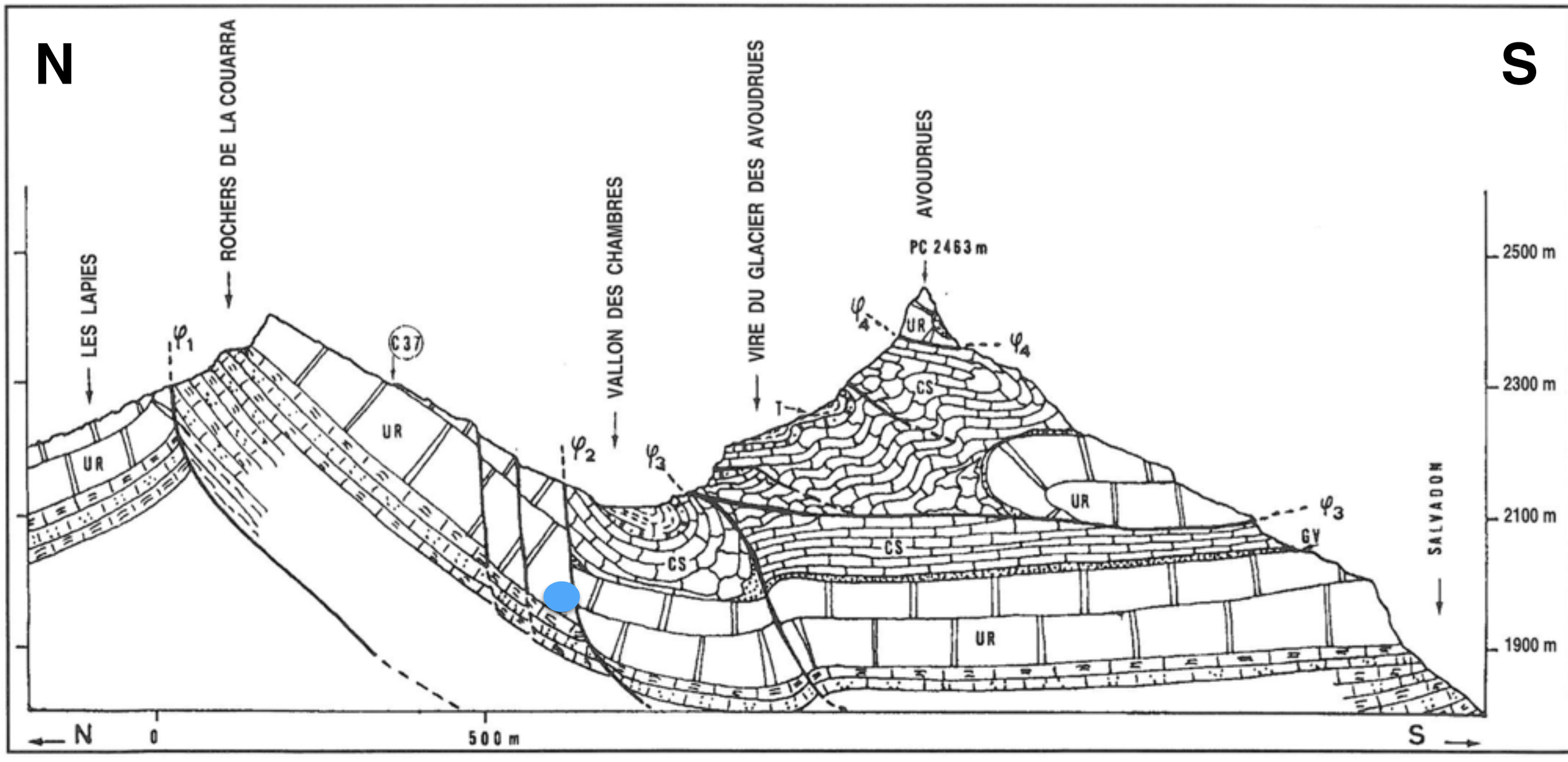


Ohl, 1991

Cross section

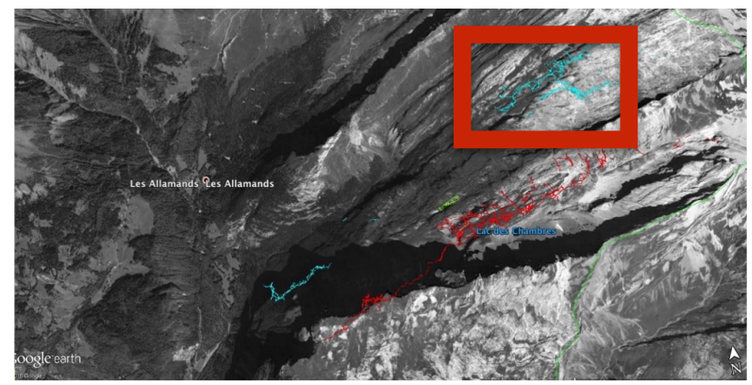


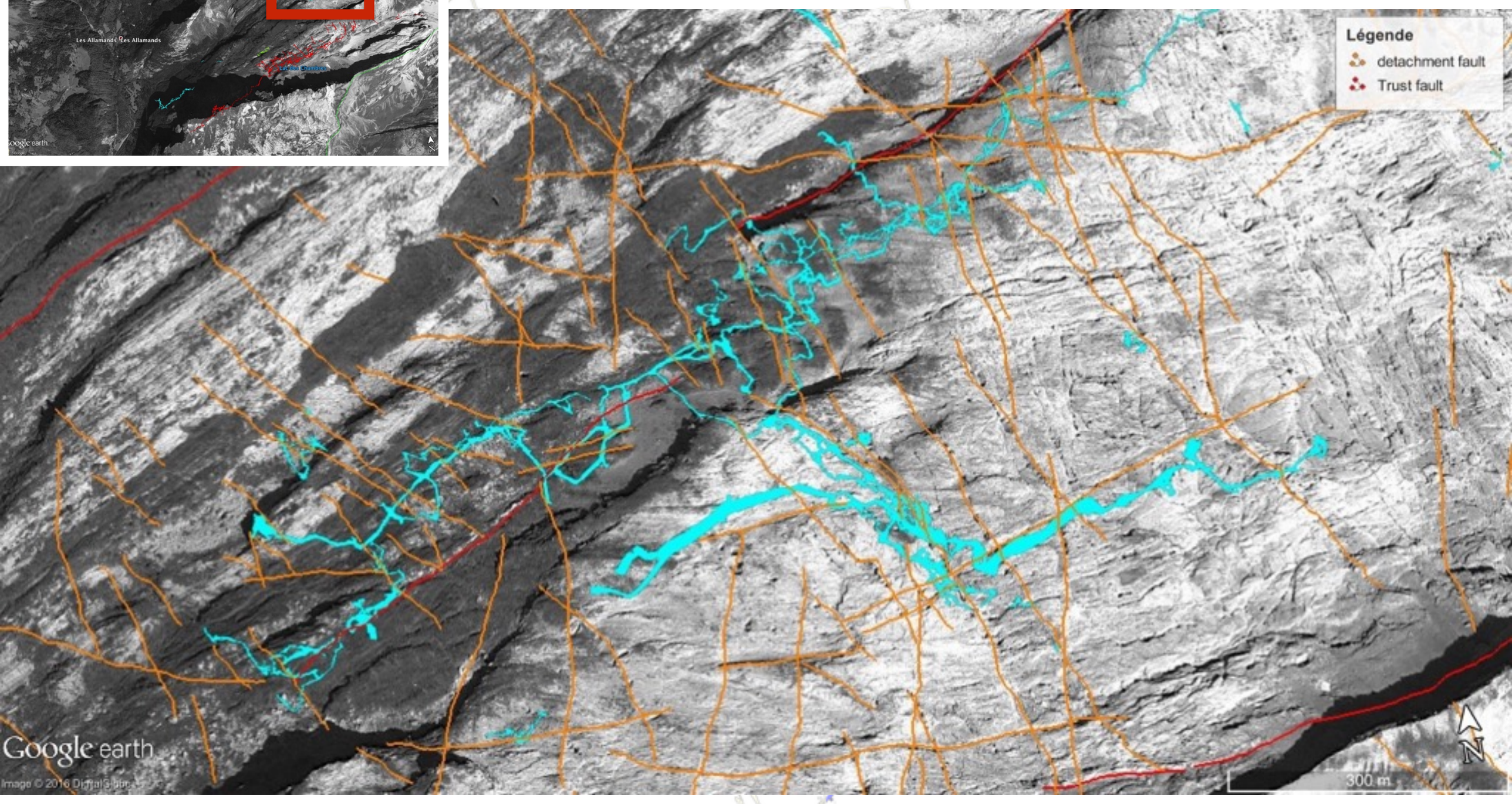
Geologic cross section



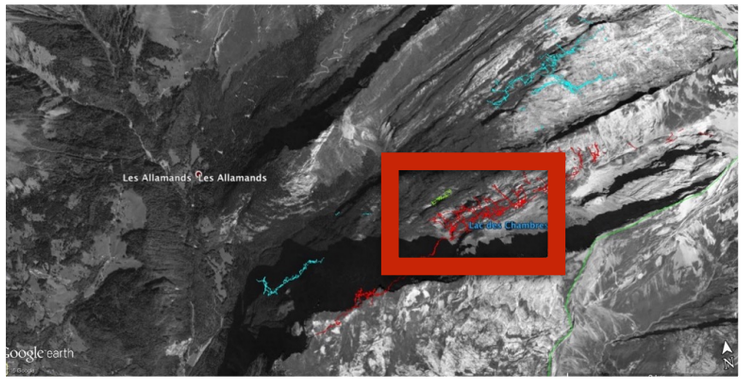
Delamette, 1991

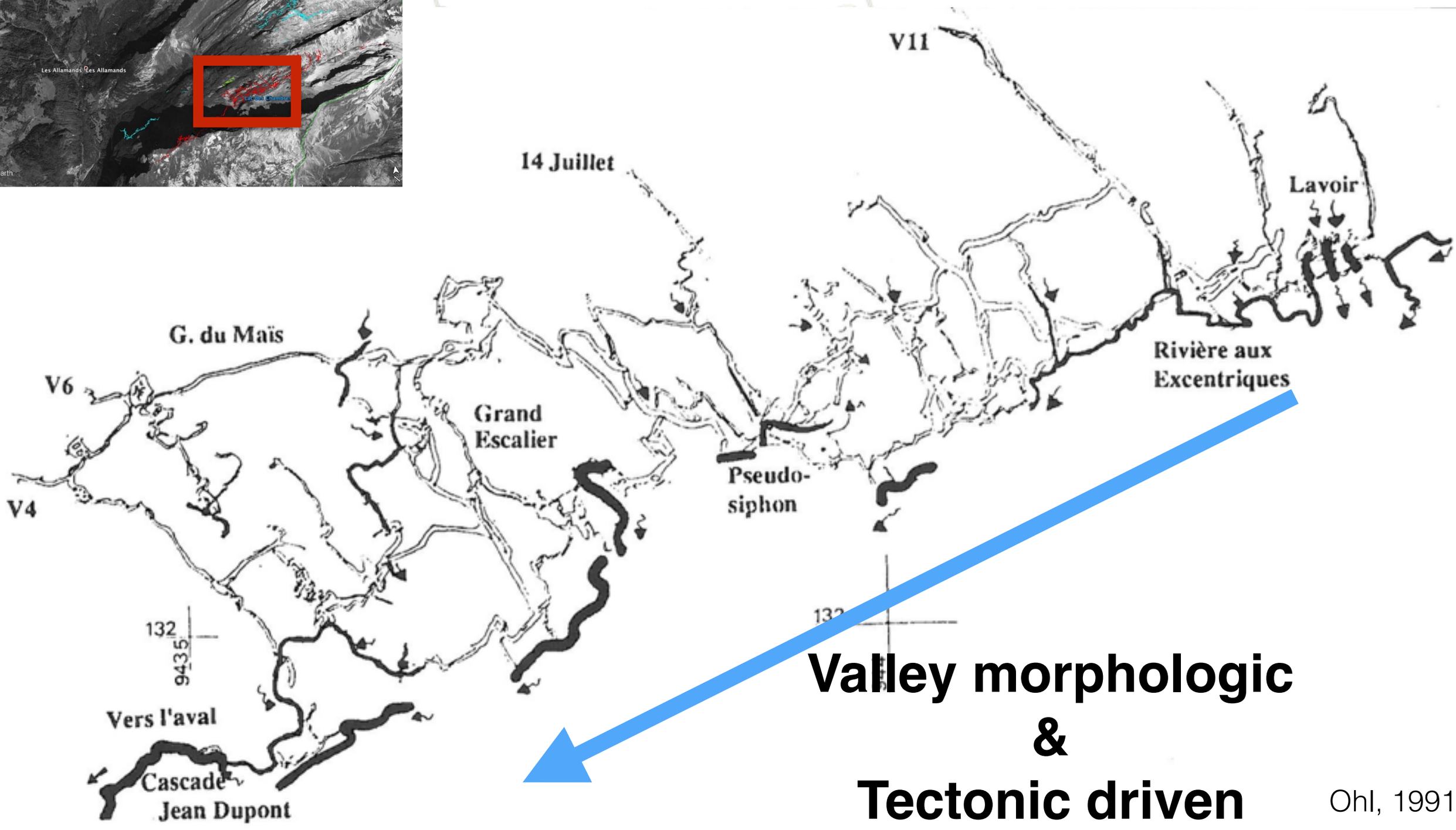
Role of the tectonics





Presents-day drainage

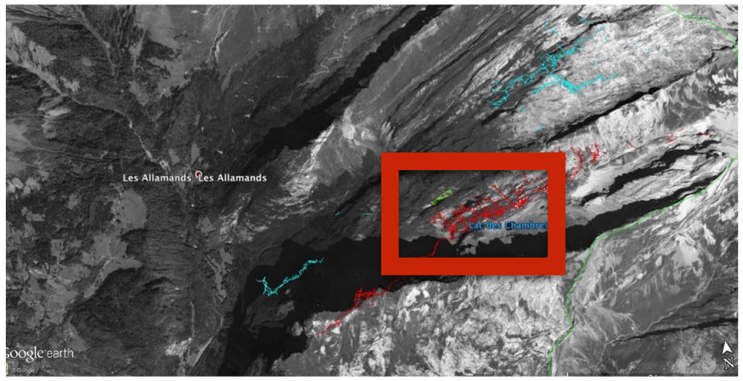


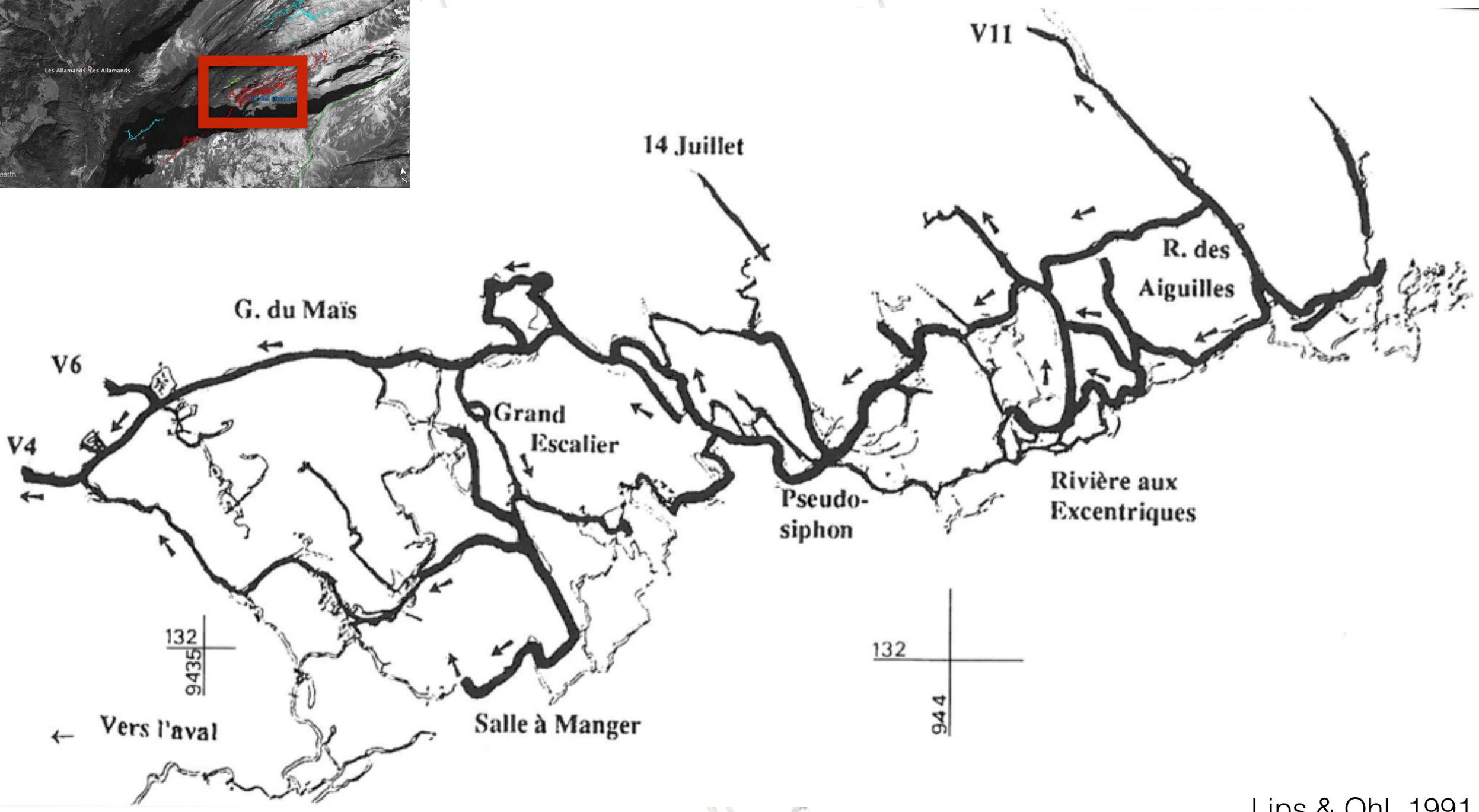


Valley morphologic
&
Tectonic driven

Ohl, 1991

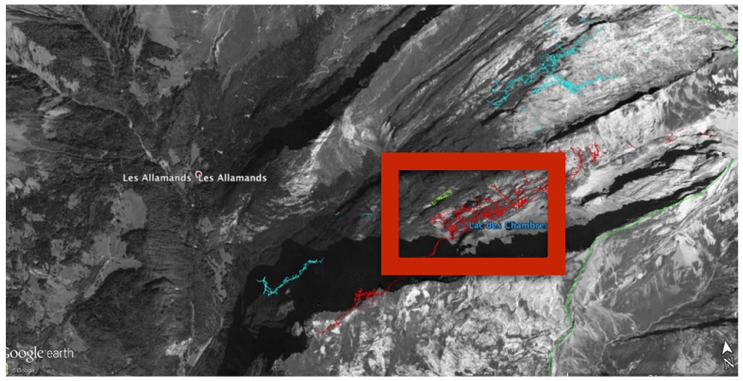
Paleo drainage

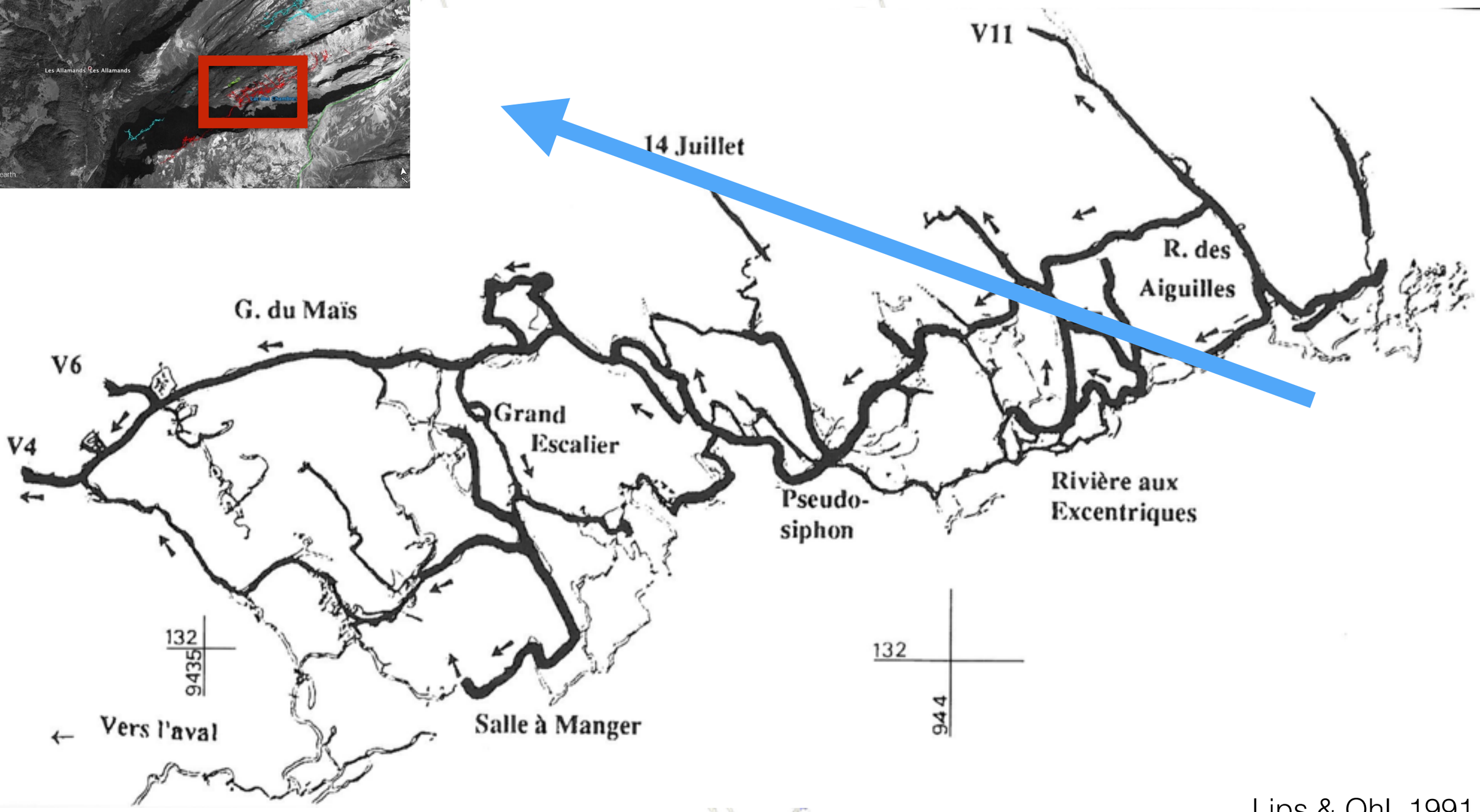




Lips & Ohl, 1991

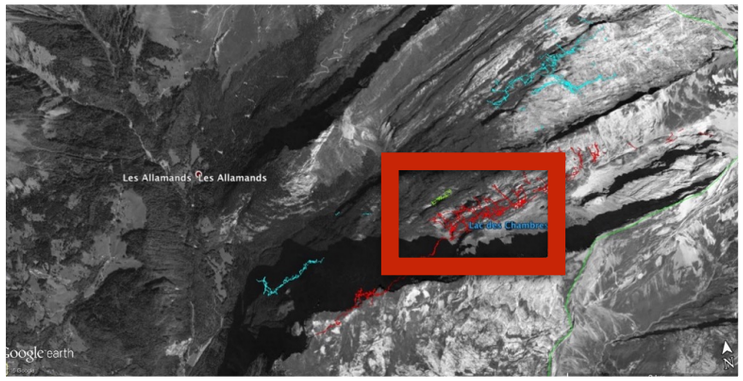
Paleo drainage

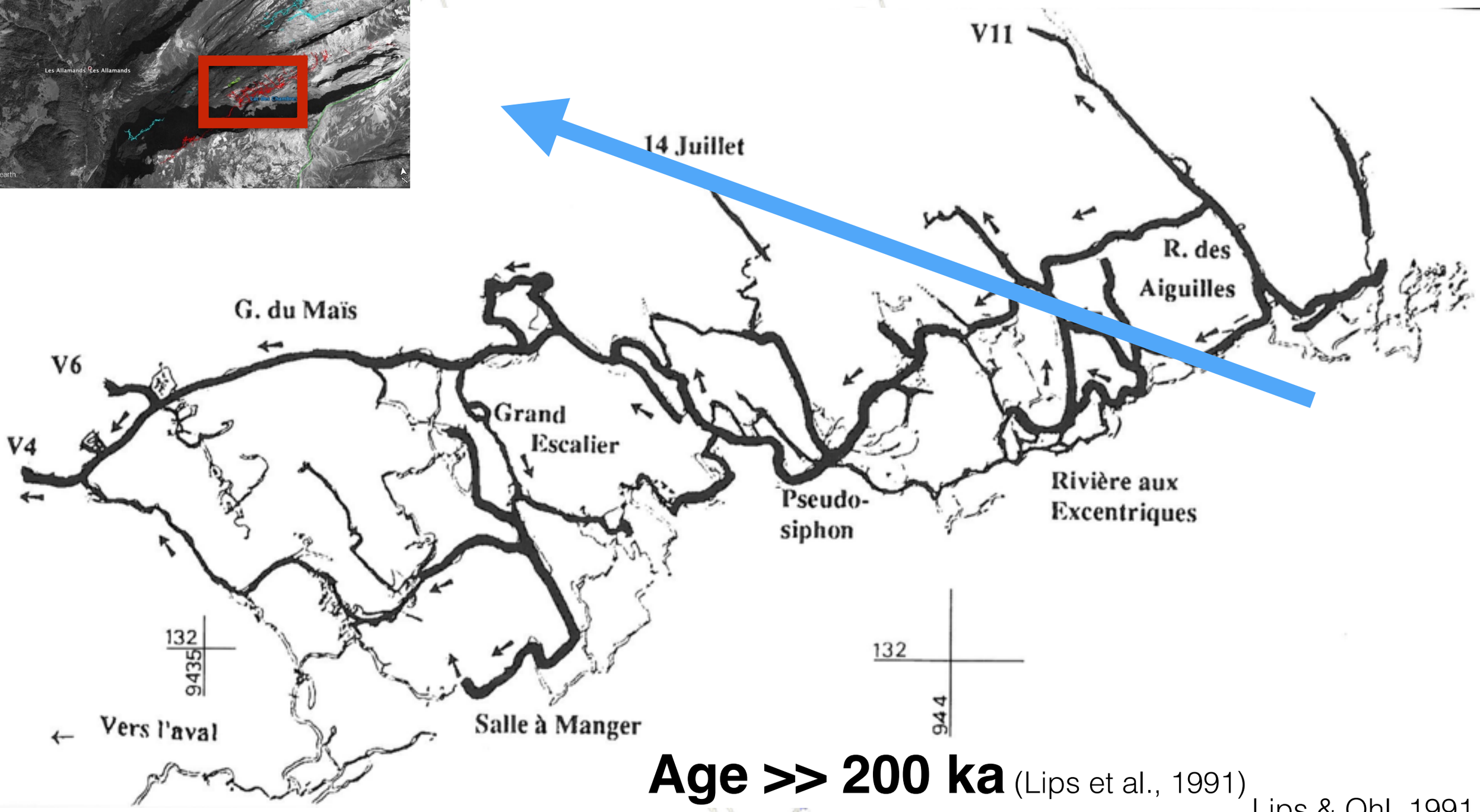




Lips & Ohl, 1991

Paleo drainage





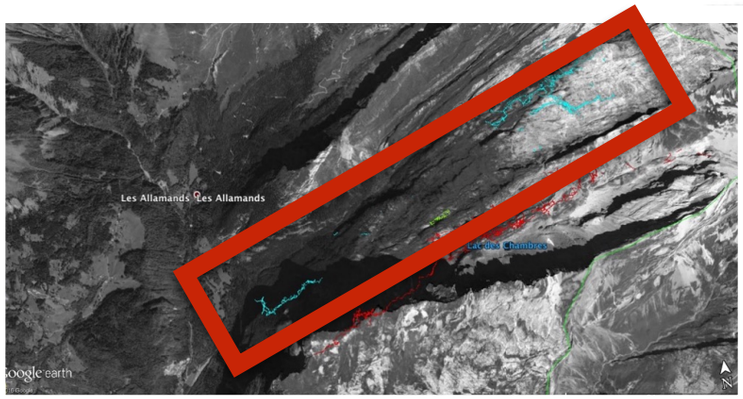
Age >> 200 ka (Lips et al., 1991)

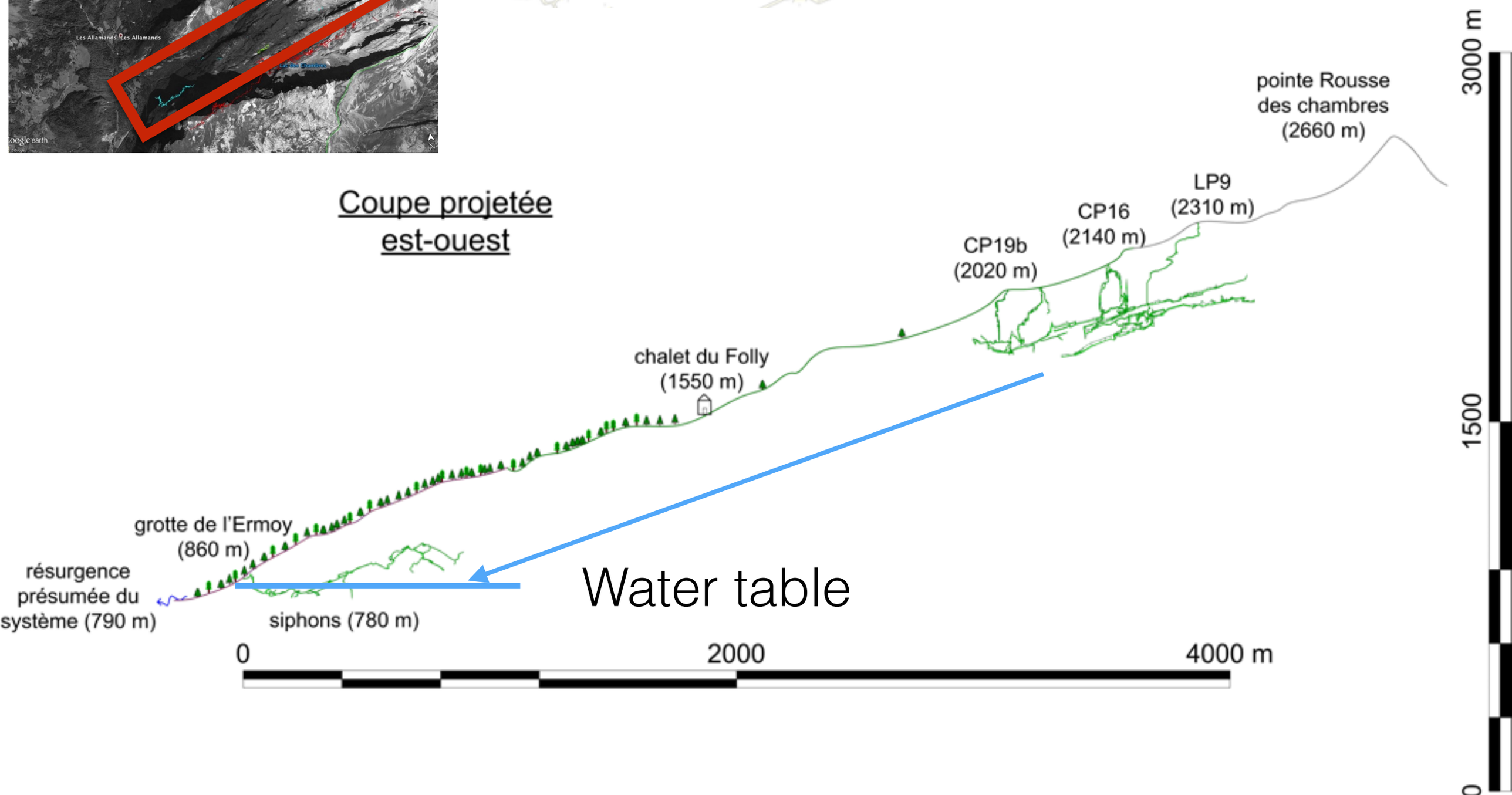
Lips & Ohl, 1991

Long term evolution ?

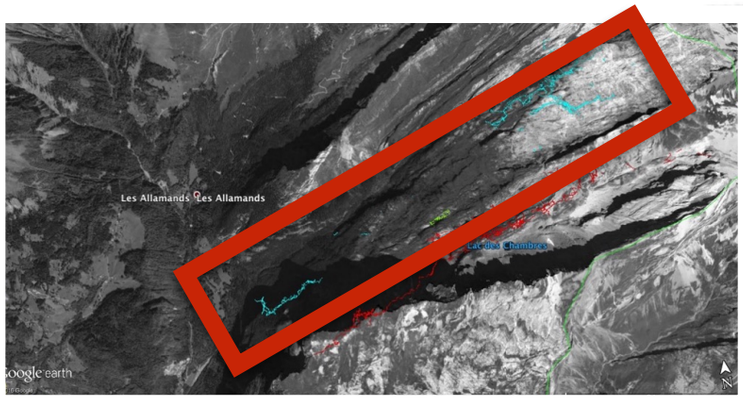
- Phreatic flows > 2 Ma, Structural slope to the NW, low relief ?
- Since ~2 Ma : Carving of glacial valleys
- Drainage to the SW, driven by the Alpine tectonic

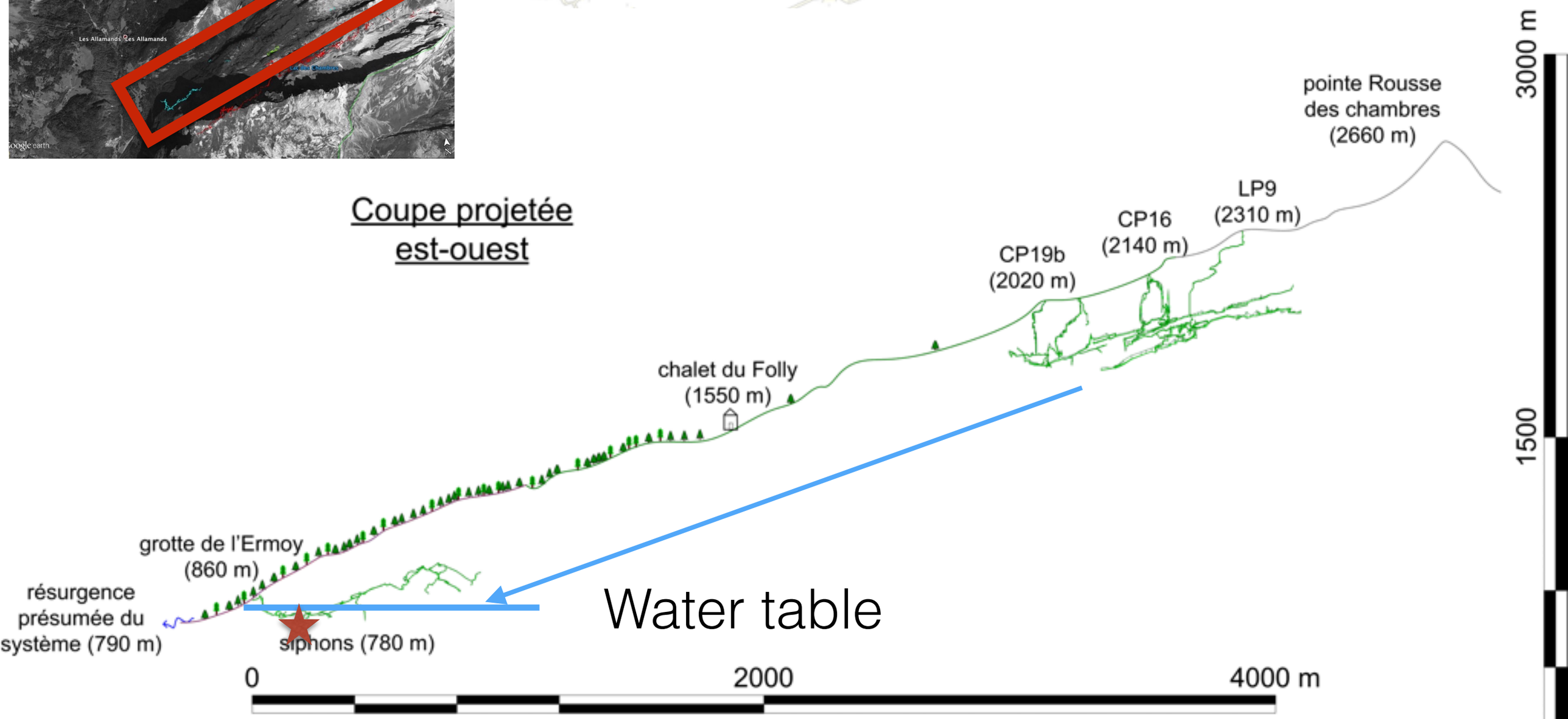
Short term observations



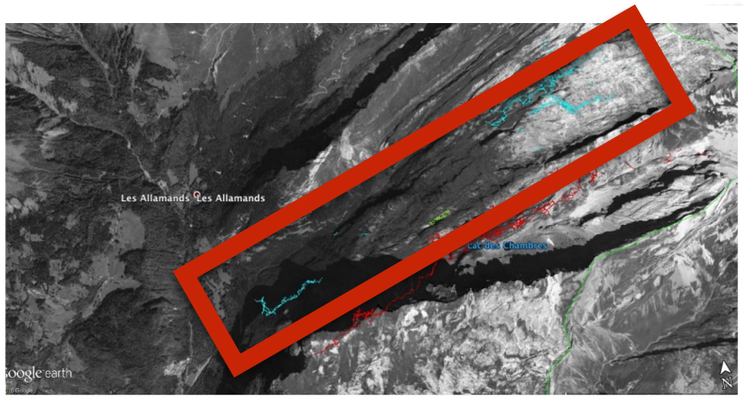


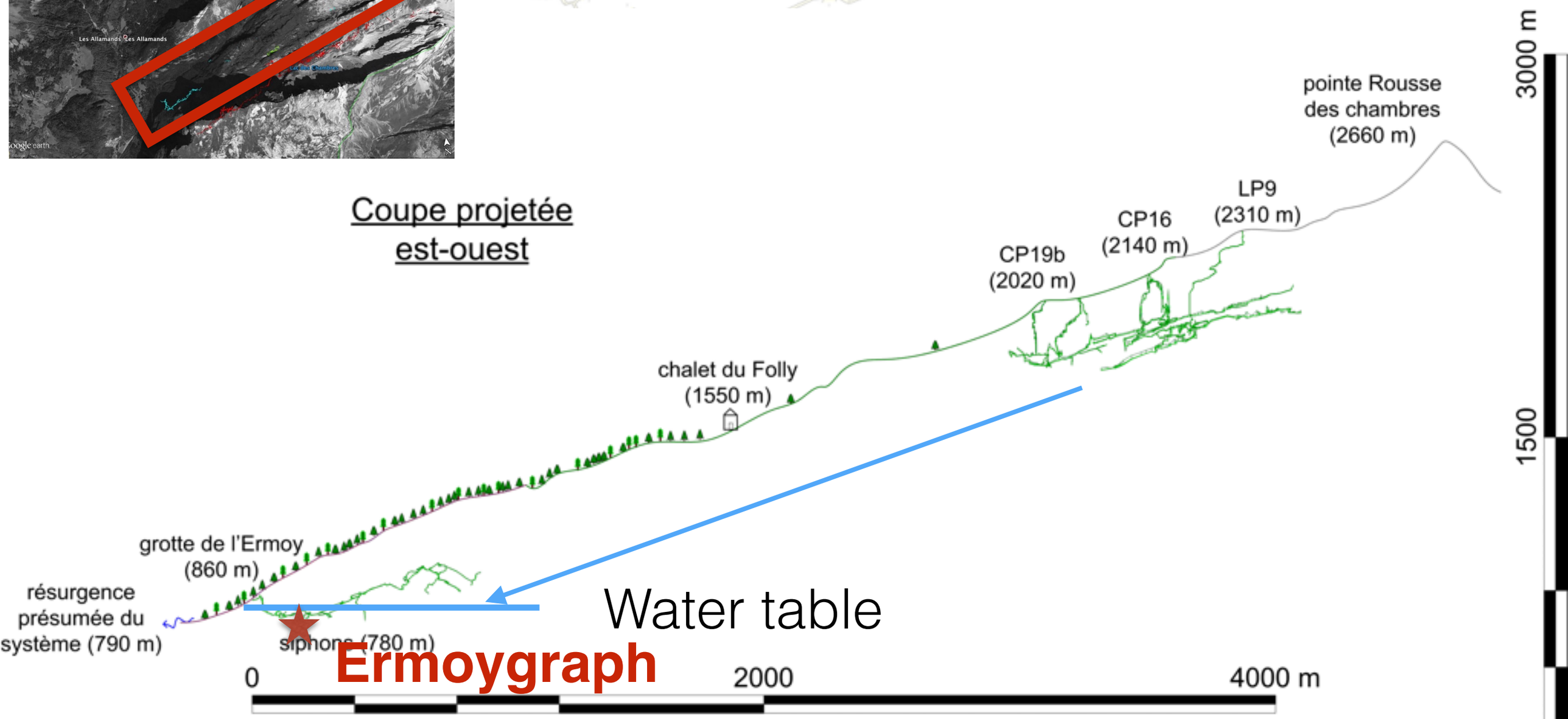
Short term observations





Short term observations

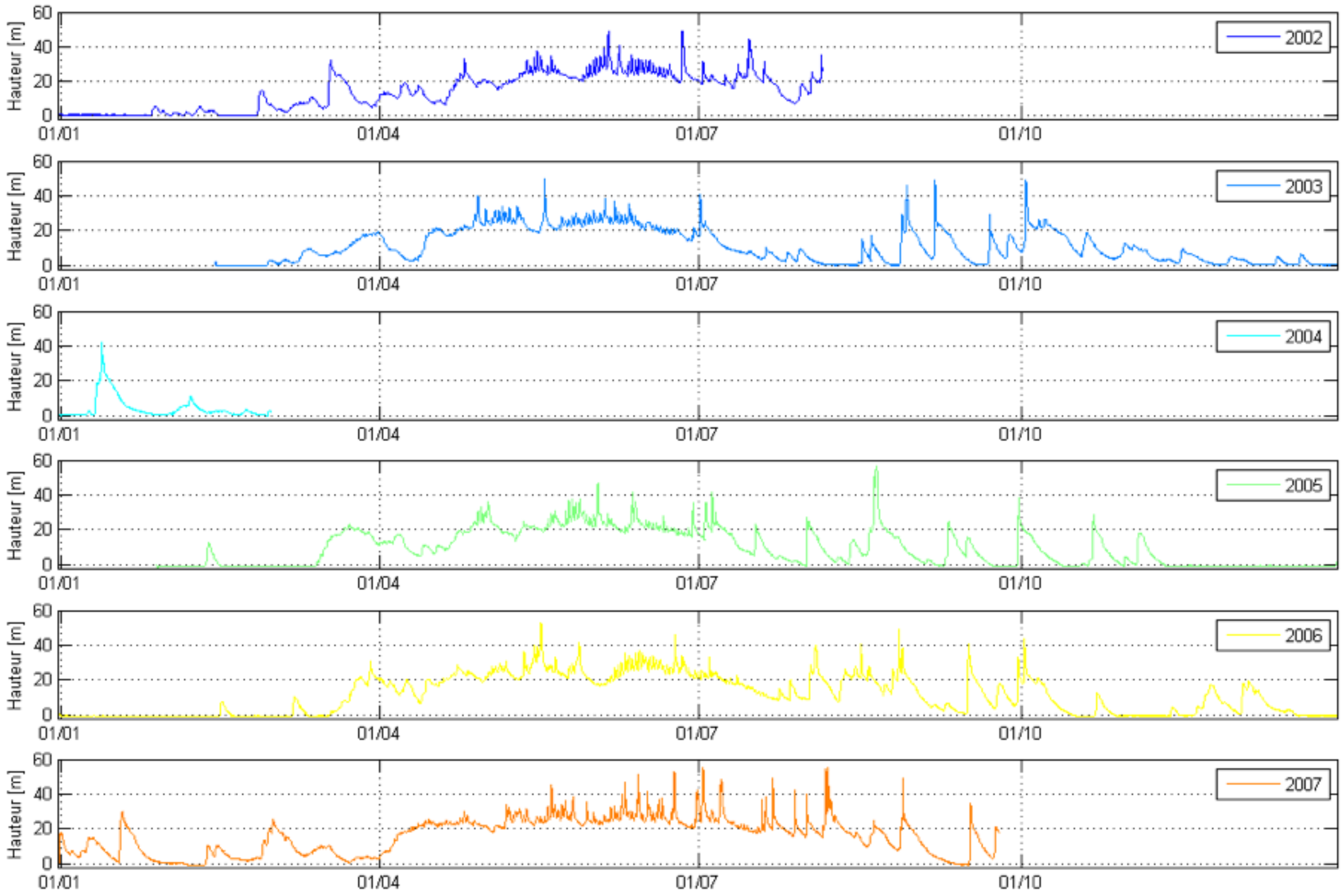




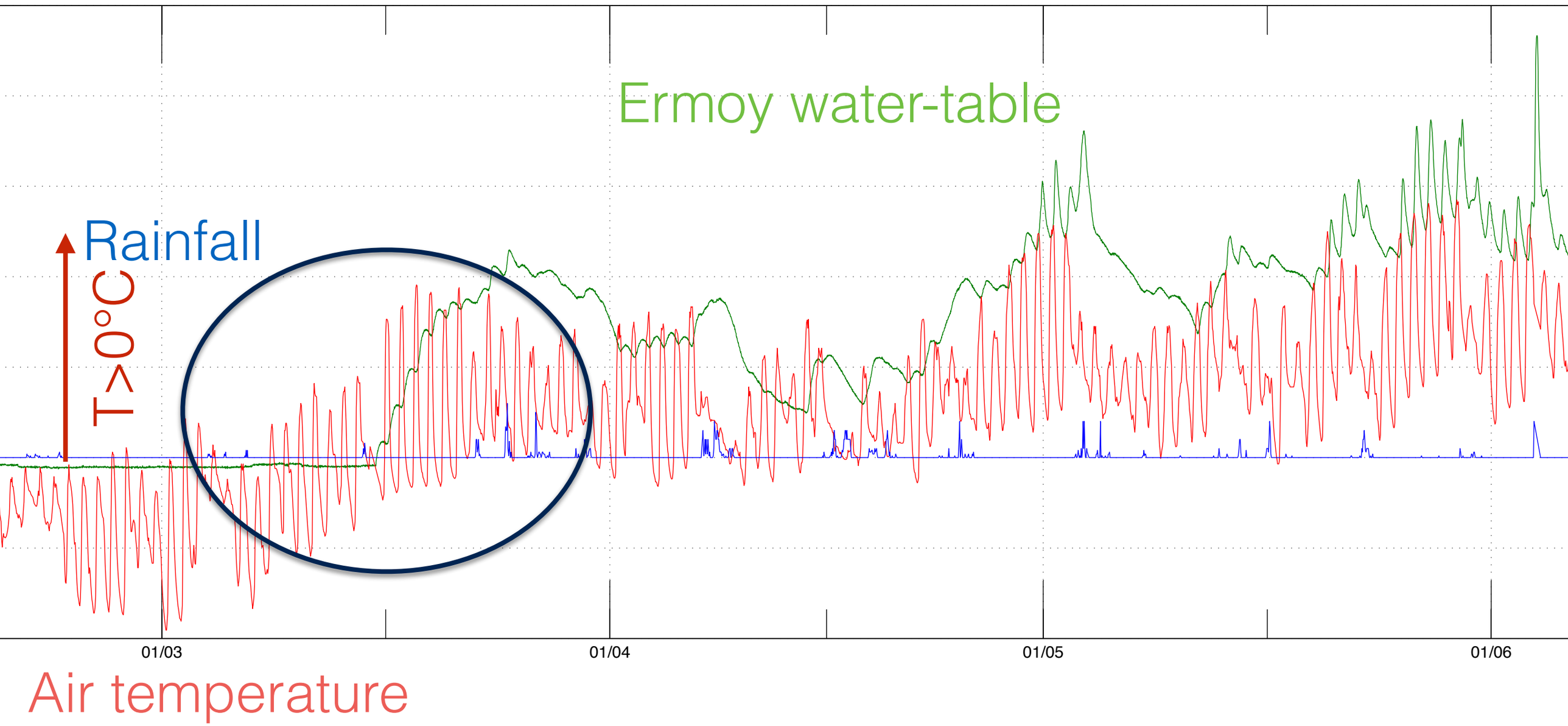
The « Ermoygraph »

- Home made data logger based on the « Luirographe »
- Developed by Laurent Morel (1995 - today)
- Records Temperature and Pression every 12 min over 2 years
- Avantages: robust and not expensive for amateurs !

Results


Hauteur [m]
60
40
20
0
01/01
01/04
01/07
01/10
2002
2003
2004
2005
2006
2007

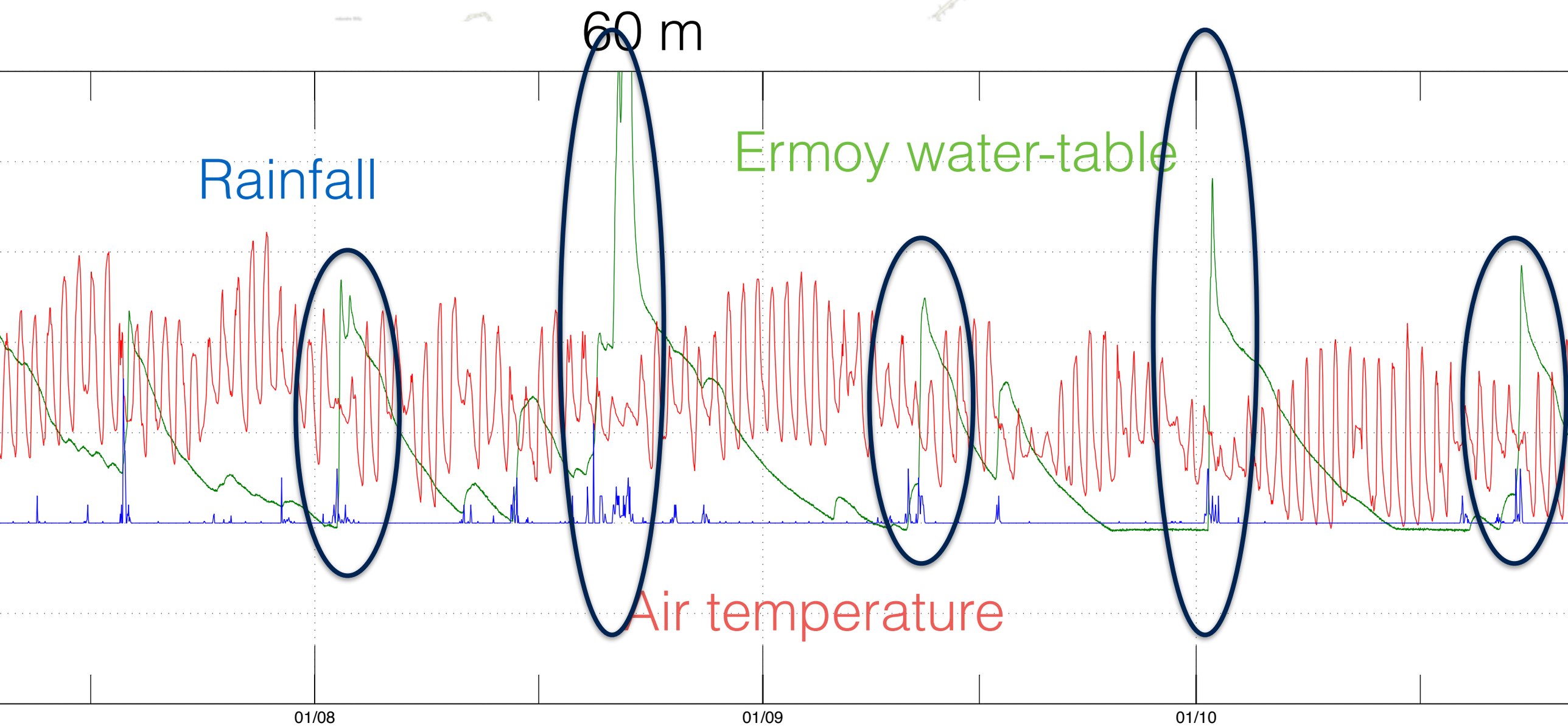
Results : role of the T



==> Melting of the snow

Data 2005

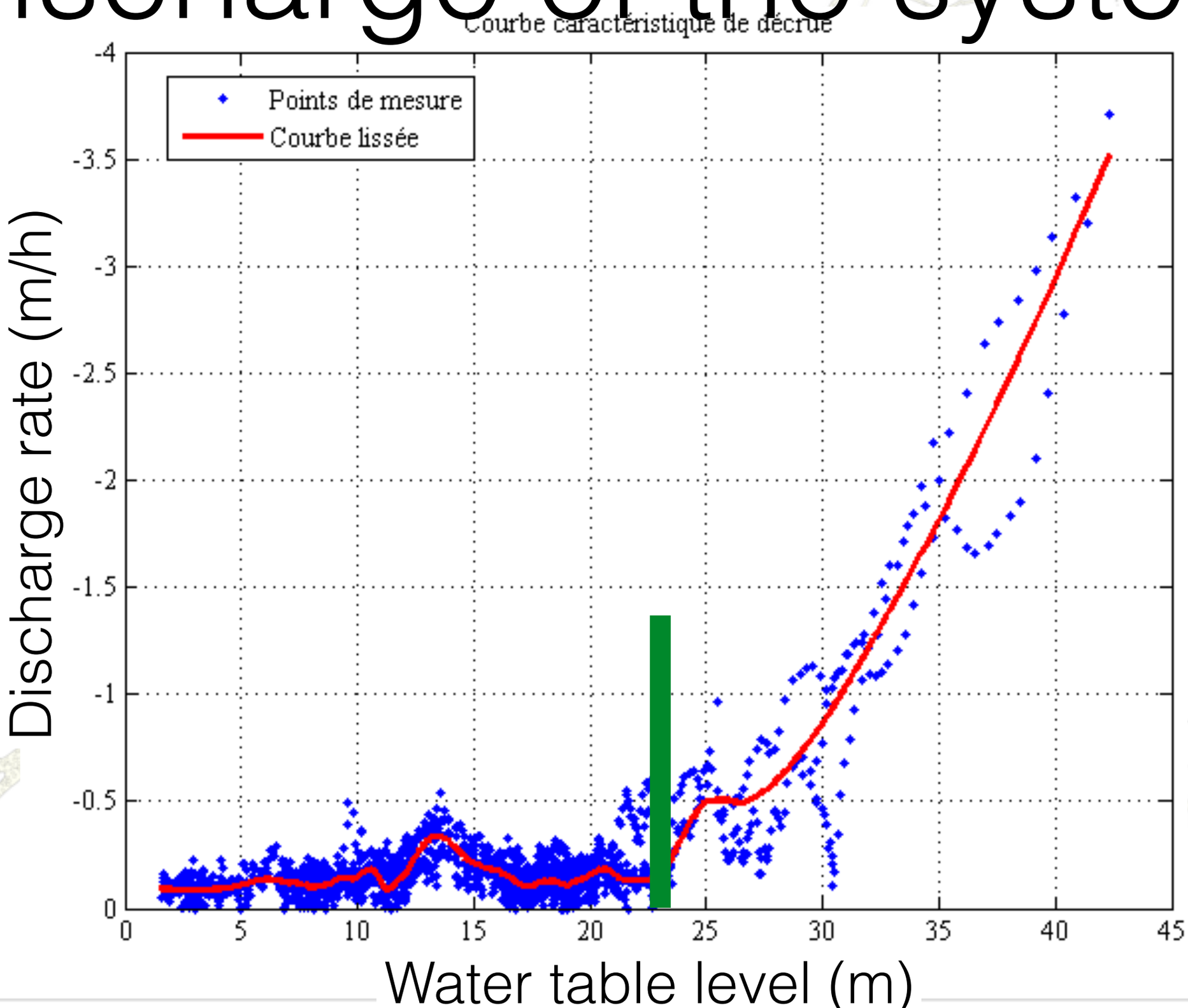
Results : role of the rainfalls



Slow discharge after a rainfall

Data 2005

Discharge of the system



Conclusions

- Alpine karstic systems :
  - Carving of galeries influenced by alpine tectonics
  - Record relief evolution at time-scales > Ma
  - Present-day karstic drainage signs recent geomorphic evolution
  - Water-table variations could bring insights to constrain recent glacial/interglacial geomorphic evolution of alpine valleys